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REPORT OF THE AGRICULTURAL EXPERIMENT STATION FOR THE YEARS 1931-1933

By
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Director



LOUISIANA STATE UNIVERSITY
AND
AGRICULTURAL AND MECHANICAL COLLEGE
AGRICULTURAL EXPERIMENT STATIONS

INTRODUCTION

The annual reports of this Station and those of most other state stations have consisted in the past of a statement in regard to the finances and a fairly detailed report on each problem that the station was investigating. In looking over this report, you will see that it differs quite materially from the ordinary Experiment Station report. In the first place the members of the Station Staff have not attempted to give a report on each project that is under way. In the second place they have not confined their reports to a period of two years. They have gone back over their work for a period of six or seven years and have pointed out the results that have been accomplished that appear to be of the greatest importance. I think that this is a thing that should be done at irregular intervals in order to sum up or to take stock of the accomplishments of the Experiment Station. If we confine our inventory taking to periods of one or two years, it is quite likely that we will not realize that the Station is making much progress; but when we look at it over a longer period of time it is easier to see the progress that is being made.

To those who are familiar with the work of the Agricultural Experiment Stations, it would seem to be unnecessary to attempt to tell what the functions of a station are. However there are many people, particularly those not connected with agriculture, who are not familiar with the work of Experiment Stations; they are not familiar with the various agencies that are trying to help agriculture. A word might be said here for their benefit.

I think the Director of an Experiment Station should look up on the state in which he is located in the way in which a farmer looks at his farm. He should take into account the nature of his soil, the climate, the labor that is available, the transportation and market for his products. A farmer's organization should be so planned as to enable the farmer to obtain the most possible out of the resources of his farm and his labor. The Director of the Experiment Station and the Station Staff stand in a position so far as the state as a whole is concerned similar to that of the farmer in making his farm plans. They need to take into account the same things that a farmer takes into account and to direct the agriculture of the state so as to get the most out of the agricultural resources and the farm labor. This means that the state as a whole should have an agricultural program just as the farmer has a program for his farm, and it is my understanding that it is the function of an Experiment Station to help to work out such a program and to make it possible to carry it out most efficiently.

If such a program is to be formulated and carried through efficiently, the Experiment Station needs to concern itself not only

with the farm enterprises that are under way at the time but it needs to concern itself also with farm enterprises that are not carried on to any great extent, but that if carried on more extensively would lead to a more efficient use of land and labor. This is something of the nature of the task that the Louisiana Experiment Station is undertaking and has had in mind for some time. After such a program is worked out for the state as a whole, and for each district, the departments of the Station should get information which will make it possible for each agricultural enterprise to be carried on efficiently. It is only by a proper combination of farm enterprises and the carrying on of each one of these enterprises in an efficient manner that the farmer may expect to get the most out of agriculture as a business. What I am attempting to show is what the function of an Experiment Station is. I do not believe that is entirely to enable the farmer to produce a better quality of cotton or other agricultural product. It is this and more. It is to have the agricultural organization such that we can expect to get the maximum returns from it.

The agricultural income of the State of Louisiana is small compared with that of many other states. I do not believe that this need be true. We have, I think, a higher percentage of good land in this state than there is in most other states of the Union. We have a long growing period and we have ample rainfall. If our agricultural resources were used efficiently, the agricultural income of this state could be increased probably two-fold or more. I have discussed some phases of this situation in Louisiana Station Circular Number 6. It has been estimated that we have in the state a million or a million and a half acres of good alluvial land that are now lying practically idle. I have stated some of the things that the Experiment Station has done looking towards possible ways of using these rich lands. I have called attention also to the fact that we have millions of acres of cut-over pine land and hill land some of which is now in cultivation is not suited for agriculture and some of it that is not in cultivation is suited for agricultural purposes. We need a complete survey of these cut-over and hill lands for the purpose of finding out which are adapted to agriculture and which are suited to forestry only. We must concentrate our farming in the hill territory on lands that are suited for agriculture, and we must plant trees to the land that is suitable for forestry. We have done nothing thus far in the way of a survey of our cut-over pine lands and hill lands. Such a survey should be under taken either by the Experiment Station or by some other agency.

You may not have noticed that in several places in this introduction I have stated that the farm organization should be such that the farmer will get the maximum returns from his agricultural resources and his labor. It is a well known fact that a one crop system makes it impossible for a farmer to use his labor efficiently.

This is a subject that has been discussed time and time again, but I think it is one that needs to be held constantly in mind by those who are trying to promote the agricultural welfare of this state. The conditions are much more favorable for the production of livestock than they are in many other states. We have a long growing period. It is possible to have pastures for every type of livestock throughout the year. We have or can produce a supply of feed sufficient to supplement these pastures. I think if we would carry on the agriculture of the state in anything like an efficient manner we should take advantage of these favorable conditions. If we do this by combining field crops with livestock production, the farmer will be able to use his time and his land to better advantage than it will be possible for him to do by confining his attention to one crop. While such a combination of farm enterprises can be advocated as a general principle, I am emphasizing it here because of our favorable conditions for the production of livestock and also because of good markets. The Louisiana Station has this thought in mind as a part of its program and is accumulating information which will enable the farmer to carry on these livestock enterprises. Our studies in the rice territory have shown that the farmers who combine the growing of beef cattle with rice production have made the most money during the last few years. With the eradication of the cattle tick, with the improvement of pastures and the better wintering of cattle in the rice territory, the income from this enterprise could be increased immensely. Likewise our studies in the hill sections have shown that the farmers who have had a combination of livestock and crop production have fared better during the last three years than have those who confined their attention to field crops. The point that I want to emphasize is that we have favorable conditions for the production of livestock, we have a good home market and we should take advantage of these conditions.

The report which follows, as already stated, points out some of the outstanding accomplishments of the Louisiana Station during the last six or seven years. The Station Staff is trying to carry out a program which will get information that will be helpful in the development and efficient use of the agricultural resources of the state. I think we have made considerable progress. There is much yet to be done and if we are to reach our goal it will require the concerted thought and effort of everyone whatever his vocation may be.

ANIMAL INDUSTRY

FEEDING VALUE OF RICE BRAN

Louisiana produces annually about 17,000 tons of rice bran which frequently sells much below its real value. While it is true that large amounts of rice bran fed to hogs produce oily pork, rice bran may be fed satisfactorily in amounts up to 40 per cent of the ration. Two series of experiments have shown the value of rice bran for fattening hogs if fed in proper combination with corn. In 1932, rice bran when fed in amounts not greater than 35% of the ration, showed a value of \$14.80 per ton as compared to corn at \$15.00, or 98.6% the value of corn. The rice bran had been bought at \$8.00 per ton. In 1933, rice bran was compared with wheat shorts as a supplement to corn, along with protein supplements. With wheat shorts valued at \$18.00 per ton, rice bran showed an average value of \$17.30 per ton, or 96% the value of wheat shorts. These experiments show rice bran to be a very economical feed for swine when fed in the right combination with corn.

MOLASSES FOR MULES

Blackstrap molasses, the chief by-product of sugar manufacture in Louisiana, is another feed that often sells below its real value. Experiments in feeding blackstrap molasses to farm work mules in 1929, 1930 and 1931, at this Experiment Station, showed that blackstrap molasses is equal to corn as a feed for work mules where from 6 to 9 pounds of molasses is fed per day. Mules receiving 9 pounds of molasses sweated more and seemed to "wind" more easily than the mules fed 6 pounds per day. When more than 6 pounds per day is fed, it is recommended that fresh molasses be fed daily in preference to mixing the molasses with the feed in quantities before hand, as the molasses mixture may ferment and cause digestive troubles.

SHRIMP MEAL

Shrimp meal, which is a by-product of the shrimp canning industry, in Louisiana, has been proven in our experiments to be superior to tankage as a supplement to corn in feeding hogs. Tankage usually sells at approximately twice the cost of shrimp meal. In three experiments with shrimp meal and tankage, fed both with and without other protein supplements, the hogs fed shrimp meal made higher gains than the hogs fed tankage and the cost per hundred pounds gain has been 8 to 9% less. A combination of equal parts of shrimp meal and cottonseed meal, two Louisiana feeds, produced greater gains per day at lower cost than where shrimp meal was used as the only supplement. The shrimp meal and cottonseed meal mixture has been superior to tankage and cottonseed

meal. The standard protein supplement now recommended by the Louisiana State Experiment Station is made up of 50% shrimp meal, 30% cottonseed meal, and 20% ground alfalfa hay or clover hay. This supplement is much more economical and efficient than tankage.

MOLASSES FOR STEERS

Two years of experimental work have been conducted with molasses for fattening steers, and shows that molasses is practically equal to corn for feeding steers, particularly when fed in amounts not much over 2 pounds per day.

SURVEY OF WOOL PRODUCTION

A partial survey of wool production in Louisiana was attempted in 1931 and 737 fleeces from different parts of the state were weighed and sampled. One of the principal results of this survey is the demonstration of the value of better breeding. Common piney-woods ewes produced about 2.4 pounds of wool averaging 2.76 inches in length, and native ewes showing some Cheviot breeding averaged 3.46 pounds of wool per ewe. Ewes out of native dams and sired by pure-bred Delaine-Merino rams produced 6.74 pounds of wool.

IMPROVEMENT OF PASTURES FOR BEEF PRODUCTION

In 1931, an experiment was started to determine the possibilities in discing, seeding and mowing black land not suitable for cultivation, as pasture for beef cattle. In 1931, this land produced an average of only 69.4 pounds of beef per acre. The field has been mowed regularly to kill weeds since the spring of that year and drains have been opened up. That fall the field was divided into equal parts and one-half was disced and seeded with 6 pounds White Dutch clover, 9 pounds Red Top and 9 pounds Italian rye grass per acre. In 1933, the half that had been disced and seeded produced 264.8 pounds of beef per acre as compared to 148.6 pounds per acre for the half that had been mowed only. In 1931 another field on somewhat better land produced a total of 372 pounds beef per acre, showing the high value of Louisiana river land for beef production.

PASTURES FOR SWINE

Louisiana white clover pasture has been shown to be of high value in production of pork. Fattening pigs running on white clover pasture gained 11 per cent faster than those fed on dry lot and the pasture saved \$7.90 worth of feed during the 100 days of the test. As 20 pigs could have been carried on the acre of clover, the acre would have been worth almost \$15.98 in feed replaced. For brood sows with small pigs pasture is especially valuable. The pigs on pasture gained 21% faster on pasture than in dry lot. In 36 days an acre of white clover pasture saved \$9.11 in feed for sows and pigs and an acre of winter oats and rape saved \$6.37 in feed.

AGRICULTURAL ECONOMICS

The Agricultural Credit Situation in Louisiana (Louisiana Bulletin No. 208). This study made a thorough analysis of the agricultural credit situation and discovered many of the weaknesses of the present credit system (1928). The analysis included conditions of credit as to term, costs, uses and security required. Specific recommendations were made with respect to strengthening the credit structure. A wider adaptation of these recommendations would certainly have eased the financial crash that has struck so seriously at Louisiana in the past few years. (Thompson)

Financing Production and Marketing of Louisiana Strawberries and Suggested Reorganization (Louisiana Bulletin No. 219). A study of strawberry marketing through the local associations in 1930. Emphasis was placed on the production credit costs, and costs of marketing strawberries through existing agencies. A comprehensive program was worked out whereby strawberry growers might strengthen their financial position by consolidating their marketing associations into a more efficiently operated agency and thereby obtain production and marketing credit at a lower cost to the growers, as well as to operate on a narrower margin through improved business efficiency. (Thompson)

Louisiana Farm Taxes, (Three Parts, Louisiana Bulletin No. 231). A complete analysis of the tax situation in Louisiana together with a suggested revision of the Louisiana tax system in the light of findings concerning the prevailing burden of taxation. Based upon findings of a study of a large number of individual taxpayers. (Thompson)

Cotton Price-Quality Relationships in Local Markets of Louisiana, (Louisiana Bulletin No. 221). A comprehensive study in determining the extent to which prices paid to farmers in local markets varied with staple and grade. Very valuable information was obtained showing the disadvantage placed upon farmers producing cotton superior in grade and staple under local market methods of buying. (Farrington)

Farm Trade Centers in Louisiana, 1901 to 1931, (Louisiana Bulletin No. 234). Since work in rural sociology commenced in 1931, a project has been completed dealing with the trade centers of the State. An analysis of changes since 1901 pointed out which types of business were gaining and which losing in importance, and showed which types could best be offered in a town of a given size. A second project is now under-way collecting the most pertinent information concerning the make-up, vital processes, (i. e. birth and death rates), and migration of the population of the State. Both of

these projects and especially the latter, furnish information absolutely necessary in any planned agriculture. (Smith)

An Economic Study of Factors Affecting Farm Organization and Power Utilization on Sugar Cane Farms, 1929 (Louisiana Bulletin No. 215). A study of comparative costs of using tractor and mule power on cane farms, and the factors affecting the unit cost of each type of power. Most efficiently used tractors were operated at a cost of \$8.08 per day compared with \$18.16 for the least efficient use. Unit costs of mule labor decreased from about \$1.80 per day when only 70 days were worked to about \$0.80 when 200 days were worked annually. Costs of loading cane with a power loader were found to be about one-third lower than loading by hand. (Reuss)

Hauling Cane by Wagon (Louisiana Circular No. 4). A very detailed study showing the financial saving to plantation owners actually obtained by the arrangement of their field layout to facilitate hauling to the hoist or mills. Important economies depend upon length of haul, size of load, and elimination of wagon and loader delay. (Reuss)

The Organization and Financial Returns of 129 Small Sized Louisiana Cane Farms, 1930 (Louisiana Bulletin No. 224). A financial test of the profitable degree of diversifying cane farms with other cash crops. Labor incomes and cash incomes increased as the proportion of cane was increased up to about 50 per cent of the crop area. Cotton and truck crops tended to reduce income when used to replace cane. These results have been too well substantiated since these recommendations were reached. (Reuss)

Rice Farm Irrigation Systems in Louisiana (Louisiana Bulletin No. 216). Irrigation costs under various systems are considered and compared. Economy of individual systems depends upon acreage flooded and size of plant. Diesel engine plants flooding less than 300 acres per plant had an average cost (1930) of \$7.54 per acre compared with \$5.46 for plants flooding over 300 acres. Electric motors are cheaper than Diesel engines for power when the acreage operated is comparatively small. (Saville)

Tractors and Trucks on Louisiana Rice Farms (Louisiana Bulletin No. 218). A detailed study of costs and accomplishments of different power units on rice farms. Costs of operating different makes and sizes of tractors and comparative accomplishments on different sized farms are presented. Decided economies in tractor costs are obtained largely through increased use, being about \$13.00 per day for an annual use of 40 days and \$7.90 for 80 days for large tractors. Important relationships between volume of hauling and truck costs are presented. Also the importance of size of farm and machinery use in labor economy are shown. (Saville)

Factors in the Organization and Successful Operation of Louisiana Rice Farms, (Louisiana Bulletins No. 217, 233). This is a comprehensive study that shows the important relationships existing between acreage of rice, yield of rice, livestock returns, cost of producing rice and farm and labor earnings. Emphasis is given to the importance of rice prices and costs in successful operation. Rice farmers were warned of an impending difficulty in the preliminary report (November 1930). The necessary steps to profitable operation are explained in the relationships between size and efficiency and the expected price for rice. Success depends upon low cost rice production rather than diversification. The most successful farmers are those obtaining high labor and machinery efficiency on a medium to large sized farm. (Saville)

Two other manuscripts are completed on use of farm machinery on hill cotton farms and the systems of farming that have proven more profitable under low price conditions. A study of farm machinery has indicated that most farmers failed to take advantage of profits from the purchase of machinery because the acreage handled has not been increased to permit adequate utilization of equipment to the extent that low cost of production could be obtained.

In the study of most profitable systems of farming the combination of cotton with livestock has proven more profitable in the period of low prices. This is due largely to the efficiency of labor in handling the same acreage of crops that farmers without as much livestock handled. Addition of farm income from dairy and other livestock products has been of extreme importance to farmers in the hill cotton area.

ANIMAL PATHOLOGY

THE VALUE OF CONTROLLING PARASITES IN HORSES AND MULES IN LOUISIANA

To determine the relationship existing between colic and infestation of intestinal parasites in horses and mules, a series of tests were conducted covering a period of four years.

The results show that colic in mules and horses could be practically eliminated if the animals were treated for intestinal parasites semi-annually. It was also shown that when the animals were free of parasites they showed a gain in weight and improvement in physical condition, thus increasing greatly their capacity for work.

This information is being used by the veterinarians and extension agents, as well as the farmers themselves with results comparable to those obtained in the experiments.

CONTROL OF ANTHRAX BY ANNUAL VACCINATION

It has been demonstrated for over a period of twenty years that Anthrax can be absolutely controlled by the practice of annual vaccination. All live stock including horses, mules and cattle owned by the University have been vaccinated annually for a period of over twenty years. During this period not a single death has occurred from this disease among the University live stock. Cases have occurred in unvaccinated stock on adjoining farms. During the past year one farmer lost 250 head of cattle from this disease.

Our results indicate that losses from Anthrax can be absolutely prevented on Louisiana farms by the practice of Anthrax vaccination.

AGRICULTURAL ENGINEERING

In 1931, Louisiana harvested a total of 326,000 tons of hay with a value of \$3,667,500. With natural sun-curing, from 40 to 60 per cent of the hay produced in this state is damaged by dew or rain. With natural sun-curing, additional feeding value is lost by the shattering of small stems and leaves, which are the most valuable parts of a plant.

The artificial hay drier developed by Louisiana Experiment Station produces a first quality hay, with feeding trials showing 1 ton of artificially cured soybean hay to be equivalent to 1½ tons of sun-cured hay. The annual hay crop of Louisiana can be increased by artificial curing by approximately 30 per cent.

The alluvial soils of Louisiana are some of the richest in the state; but are cut up into small plots, because of the many open drains necessary in order to secure adequate drainage. These open ditches and small plots hinder the use of large field machines. However, a five-year study of corn and soy bean production has proven mechanical power units and larger machine units to be satisfactory.

The largest single saving was obtained by substituting a heavy disk in place of a plow during seedbed preparation. Over a 3-year period the disked land gave yields equal to that of the plowed land.

Summary of Power and Labor per Acre

Two-mule implements	\$8.27
Two-mule plowing—4-mule cultivation	7.10
General Purpose Tractor plowing—4-mule cultivation	6.36
General Purpose Tractor plowing—Tractor cultivation	5.92
General Purpose Tractor disking—Tractor cultivation	4.18

In order to secure machinery better adapted to sugar cane culture, considerable work has been carried on cooperatively with

Case, John Deere, and International Harvester Machinery Companies. Directly or indirectly, through our efforts, three tractors and attached implements well suited to sugar cane have been developed.

The hauling of the cane crop during wet years presents a difficult problem. Wagons with various size steel wheels and various size rubber tires are each being tested. Large diameter low pressure rubber tires reduce the drafts approximately 50 per cent of that of the steel wheels.

Preliminary surveys and test stations have been established to determine more accurately the problem of drainage ditch maintenance. Drainage ditch maintenance requires from 7 to 12% of the operating cost on a plantation as now practiced.

ENTOMOLOGY

During the past seven years the resources and efforts of the Department of Entomology have been concentrated primarily upon the problem of assisting sugar cane growers to control the sugar cane borer and other insect pests which have been an important part of the problem of maintaining the sugar industry in Louisiana.

In the seasons of 1926 and 1927, it was clearly demonstrated that a very important degree of control of sugar cane borer multiplication may be secured by destroying the first generation of borers which frequently occur concentrated in fields of early maturing corn. Such heavily infested early corn may be easily identified by the planters and these areas may be made a trap for borers by cutting and feeding out the corn as soon as tassels begin to appear. This practice allows a period of about ten days for removal of the corn and yet prevents to a very large degree the emergence of moths therefrom which might multiply later in the season on later corn or spread to fields of cane nearby. In a number of cases which were carefully studied, planters have credited the disposal of trap corn with having protected their cane crop to a very large degree against borer damage.

No method of insecticidal control for the sugar cane borer had been found effective or practicable until the beginning of our applications of sodium fluosilicate, which were made in the fall of 1925 and continued through the season of 1926 especially. These applications showed that sodium fluosilicate of the lightest, best dusting type available, applied to the cane fields in the form of a dust, resulted in the destruction of from 40 to 63% of the borer stages in the cane within two weeks after the dust was applied. It was found that the most strategic time for the application of sodium fluosilicate is usually during July, soon after the eggs for the second gen-

eration have hatched and before the borers have become large enough to do serious damage to the cane. At this season of the year control by egg parasites is usually very slight, naturally. Therefore an application of the sodium fluosilicate at this time supplements the work of the parasites and renders their later control of the borer still more effective. It requires from 5 to 10 pounds of sodium fluosilicate per acre applied in July to accomplish this result, and planters have frequently found this to be an advisable practice.

The principal effort of the department during the past seven years has been to discover whether it may be possible to increase the efficiency of the egg parasite, *Trichogramma minutum*, Riley, which is the principal natural enemy of the cane borer in Louisiana. Previous to our investigations these egg parasites had not been found to occur in cane borer eggs before the latter part of June, and we found that in many cases they did not occur in fairly heavily borer infested fields of cane before some time in August. The idea occurred therefore to the entomologists that if it were possible to multiply this parasite upon some one of its many alternate host eggs, and colonize in the fields upon cane borer eggs so as to start their beneficial work earlier in the season and at a higher rate of parasitism, their usefulness might be greatly increased.

In this effort the entomologists at the Louisiana Experiment Station developed methods for producing the borer egg parasites upon the eggs of the Angoumois grain moth, which could be bred from corn or other grain throughout the winter and thus provide an abundant and favorable host egg supply for the parasite at a season when no cane borer eggs occur. It has now been fully tested and become commercial practice to produce these egg parasites in this way and they are being utilized in many problems of insect control in various parts of the United States and for control of the sugar-cane borer in Barbados, Mexico and Peru especially.

Field colonization work conducted through seven seasons has shown a very consistent and decidedly important benefit in the control of the sugar cane borer and the increase in the sugar produced per acre in properly colonized areas. Naturally it requires some time to develop reliable methods for testing and measuring the extent of these benefits. During the past seven seasons, without exception, the average results of this work have proven to be decidedly helpful. The extent of the benefit was first measured in terms of increased sugar produced per acre in the season of 1932, and later in 1933. The experimental methods used and the results secured are stated in fuller detail in Louisiana Experiment Station Bulletins No. 235 and 248.

To summarize these results very briefly, we may say that in the work of 1932 the average results in a large number of fields considered as "protected" by colonization work, showed an increase

of 968 pounds of sugar per acre more than the average yield secured in a large series of comparable check fields where only natural parasitism occurred. This increase in sugar at prevailing price for sugar gave a gross value of \$29.04 per acre, with a cost for colonization work totalling less than \$1.00 per acre, therefore a net profit of \$28.00 per acre may be considered the average value of the colonization work conducted in 1932. County agents secured equally good results during that season.

In 1933, under less favorable conditions for parasite colonization and with generally lighter borer damage, the average of colonized areas yielded 355 pounds of sugar per acre more than the average of their comparable check areas. At the prevailing price for sugar in 1933, this gave a gross increase in value of \$12.44 per acre. Again, colonizations made in June at the rate of 5000 to 6000 parasites released per acre, cost approximately \$1.00 per acre; while colonizations made at the first of August, at the rate of 10,000 parasites per acre, cost nearly \$2.00 per acre. The net profit on the entire work in 1933 averaged more than \$11.00 per acre as a result of colonization and according to plantation records as to yields and analysis.

In each season there was shown to be an average yield increase of approximately 20 pounds of sugar per ton in colonized areas more than in their comparable check areas, and taking an average of all varieties tested. There was also a very definite increase in the amount of sugarcane harvested and milled, ranging from one to three tons or more with some varieties where colonization was practiced. The moth population produced through the summer season in millable cane has been reduced approximately one-half in an average of all the tests thus far made.

Experimental work conducted to measure the effects of borer infestation upon the value of seed cane and the yields in crops following has demonstrated the importance of using as seed plats of cane of any variety which are as free from borer infestation as it may be possible to secure.

The results of this work have been published in Louisiana Experiment Station Bulletin No. 240. It appears that as borer infestation in seed cane of any variety increases there is a somewhat correspondingly close relationship to increase in the skips or unoccupied stretches of row in the field. There is a corresponding decrease in the germination of the cane and a retardation effect with the heavier infestation of the seed. The reduction in yield of the plant cane crop in some cases ranged as high as a loss of 7 tons per acre in the more heavily infested seed and with the more susceptible varieties of cane. The more vigorous growing varieties may compensate in a large degree for borer infestation in the seed, but the value of borer-free seed cane is still decidedly important.

CROPS AND SOILS

USE OF LIME ON STRAWBERRIES

The solving of various fertility problems of the State of Louisiana has in a large part been accomplished by the untiring efforts of the men engaged in the study of soils. The need of rather definite amounts of lime on the more acid soils of the famous Hammond strawberry section for the growing of strawberries has been definitely established. With lime the plants come through the summer in a very vigorous condition, whereas without lime the plants deteriorate and die. The finding out of this fact alone will save the strawberry growers thousands of dollars. Experimental results indicating the amount of lime needed for soybeans, sweet clover, Austrian winter pea, etc. on the various soils of the state will result in the most economical use of lime.

CALCIUM ARSENATE HARMFUL TO RICE

The establishment of the fact with pot experiments of the extreme sensitivity of rice to small amounts of calcium arsenate—incorporated in the soil through cotton dusting—will warn the farmer of the inadvisability of following cotton with rice, and thus save him partial crop failures.

SOIL AND FERTILIZER STUDIES

The practical knowledge that the farmer has obtained in regard to the proper ratio, amount, placement and source of fertilizer ingredient through the study of the soils research laboratory has saved the farmers of Louisiana alone tens of thousands of dollars.

The setting forth through field tests of the special need of potash and phosphorus on certain soils will save the farmers hundreds of thousands of dollars on these soils. Where these extreme deficiencies exist, crops like cotton are often nearly a complete failure. The field tests demonstrating the practical value of winter legumes in growing nitrogen will save the farmer a large part of his fertilizer bill as well as bring his land to a higher state of productivity.

Land classification studies, which have been carried on will, with further expansion give untold information in the adjustment of land utilization.

FORAGE AND SMALL GRAIN CROPS

The most outstanding progress made with forage crops during the past 5 years has been in conducting definitely planned experiments and plant breeding projects which have given some light to

the Louisiana farmers' problems as regards the variety, date, rate, method of planting, and the culture and harvesting of the crops that are to furnish feed for livestock and leguminous fertilizer for the live-at-home farm program. New varieties and crops have been introduced and developed. Some have been improved by selection and crossing. Under the present farm conditions a farmer must grow ample feed and seed, and as much of his nitrogen as is possible in the form of leguminous crops, for his needs.

Preliminary results indicate that:

Soybeans adapt themselves to a wide range of possibilities when the proper varieties, methods, and culture are considered for the particular uses for which they are grown.

Some varieties of clovers, and vetches, and Austrian and tanger peas produce substantial yields for soil improvement or for pasture and hay. Alfalfa is dependent upon the application of some form of lime when grown on the bench-land soil. Lespedeza sericea requires cultivation to produce satisfactory growth and seed the first year.

Grain and sweet sorghums provide good insurance for a feed crop when corn fails and may also be used for silage. They may be planted from April until August.

The so-called rustproof types of oats are not sufficiently resistant to crown rust to produce satisfactory yields under severe rust conditions obtained during some years in South Louisiana. In cooperation with the U. S. D. A., new crown-rust-resistant varieties crossed with our high yielding "rustproof" oats have been introduced and are showing promise.

VALUE OF WORK AT THE OUTFIELD STATIONS

The work at the Outfield Experiment Stations has been helpful in:

First—Bringing home to the farmer the importance of choosing crop varieties best adapted to his own soil and climatic conditions, by showing that very often some popular variety will produce only half as much as an improved adapted variety.

Second—Introducing and testing new varieties developed by this and other experiment stations under a wider range of conditions than could be attained by the main and branch stations alone.

Third—Showing the most profitable ratios and amounts of fertilizer applicable to each soil type, thus giving the farmer the most for his fertilizer dollars and showing others where it may be profitable to use fertilizers.

COTTON BREEDING

It appears that the Experiment Station is making some progress in cotton breeding. Not only is the staple of our varieties and

strains becoming longer and more uniform in length, but the production, in comparison with other varieties, is increasing. In 1932 eleven tests were conducted in various parts of the state. The average production of Station strains and varieties in these tests was 357.9 pounds of lint per acre. The average production of varieties from other sources was 335.0 pounds per acre. The average production of the best Station strain, which outyielded all the varieties tested, was 403.2 pounds. The leader and two others of the five ranking varieties in the tests were Station selections.

Figuring on basis of the yields made in these carefully conducted tests the past season, if the cotton acreage of Louisiana had all been planted in our best variety, the state yield would have been increased 231,472 bales. This would represent a value of \$11,573,600 if cotton is valued at ten cents a pound.

GOOD COTTON CAN BE GROWN IN SOUTH LOUISIANA

The Experiment Station has shown rather conclusively that a good crop of cotton can be produced in South Louisiana even under the adverse cotton growing conditions prevailing there. The following figures on lint yields per acre at Baton Rouge since 1927 show this:

	Bluff Land	Bottom Land
1927	Dixie Triumph 411	Delfos 304
1928	Dixie Triumph 554	Delfos 352
1929	Dixie Triumph 523	Delfos 490
1930	Dixie Triumph 644	Delfos 637
1931	Dixie Triumph 711	Delfos 782
1932	Dixie Triumph 455	Delfos 393
1933	Dixie Triumph 657	Delfos 836
Seven Year Average	565	542

The state yield for the ten-year period, 1922-1931, was 191#; the yield in 1932 was 173#, and the indicated yield in 1933 is 183#. Yields made by farmers in the vicinity of Baton Rouge are low, probably not more than 100# of lint per acre on the average.

The experiment Station has found that good yields may be produced regularly by using good cultural methods, fertilizing judiciously, and by using poison freely to control boll weevils.

RICE SOILS

The effects of the decomposition of organic matter and flooding on the oxidation-reduction equilibrium, on the solubility and availability of the nutrient elements and on the changes in the profiles of the Crowley series and other soils of the rice area have been studied.

It has been found that within a few days after submergence the soils become highly reducing, Eh 0.04 to 0.20 volt, and the solubility of the iron and manganese in the soil solution is markedly increased while the solubility of phosphorous both native and applied is decreased to extremely low values. The addition of organic matter, soybeans, to the soil before planting rice increased the concentration of the reduced products in the soil solution soon after flooding but also increased the concentration of phosphorus in the soil solution. There is no marked increase or accumulation of soluble aluminum in the flooded soil but soluble silica is present in the soil solution in concentration as high as 30 p. p. m. Under highly reducing conditions in compacted soils there is formed an incrustation or sheath of precipitated iron compounds around the older rice roots which either renders them ineffective or causes them to decay. The precipitation of the reduced products around the roots is apparently caused by the diffusion of oxygen from the root or the presence of a slightly higher oxygen tension at the root surface than in the abnormally reduced soil solution.

Results from the growth of rice in pots on virgin Crowley silt loam and on the same type of soil that had been planted to rice for a number of years shows that the addition of organic matter, soybeans, to the soil increases the response to phosphorus and potassium. On the new soil the increases in the yield of grain from the additions of organic matter alone and combined with phosphorus, potassium, lime and sulfur varied from 33 to 88 per cent. The addition of organic matter alone increased the yield of rice, grain, 57 per cent. Organic matter in combination with phosphorus increased the yield 66 per cent, while organic matter in combination with phosphorus and potassium increased the yield 81 per cent. Small applications of lime increased the effectiveness of phosphorus somewhat but did not increase the effectiveness of potassium. Equivalent applications of sulfur depressed the effectiveness of the additions of phosphorus. The increases in yield on the old cultivated soil from the addition of organic matter alone and in combination with phosphorus and potassium varied from 32 to 136 per cent. The old soil did not respond significantly to a complete commercial mixture or to the fertilizer elements singly or in combination without organic matter. These results indicate that the increased yields from the addition of organic matter, soybeans, are due more to the production of carbon dioxide and the development of a better physical structure that permits of better aeration in the soil than to the direct nutritive effects of the elements carried in the soybeans. The presence and decomposition of organic matter in soil is a major factor in maintaining the availability of phosphorus and potassium in irrigated soils.

Studies on the changes in profile of the coastal prairie soil show that irrigation increases compaction of the B horizon. The use

of salt water causes the compaction to develop more quickly which may reduce the percolation of water and the diffusion of gases to a critically low point so that rice growing on compacted soils low in organic matter is injured from reduction and the lowered availability of the nutrient elements associated with the low oxygen supply. In some cases an increase in alkalinity accompanies the extremely poor drainage. There are present in the soils of the rice area localized spots of degraded siliceous materials which show that the soils are degrading or changing from solonetz like to soloti profiles. In general these changes have not progressed far enough to affect the fertility to a great extent.

Experiments with the use of organic matter, gypsum, lime, and sulfur for the purpose of correcting the physical state and increasing the aeration in Crowley soils are in progress.

A copy of a paper on the profile studies which will soon appear in "Soil Science" is attached to this report.

DAIRYING

To obtain a better utilization of cotton by-products, three series of experiments have been conducted. In one test it was found that 206 pounds of whole cottonseed were required to replace 100 pounds cottonseed meal in a good dairy ration, that cottonseed fed only with legume hay in dry lot, or on pasture, was not a satisfactory ration (La. Sta. Bul. 227). In the second series cottonseed hulls fed with a high protein grain, silage, and oyster shell flour were found superior to upland grass hay, about equal to choice Bermuda hay, and inferior to mixed clover hay for winter milk production (La. Sta. Bul. 238). In tests now under way, an all-Louisiana ration of cottonseed meal, or soybean oilmeal, yellow corn, oyster shell flour, molasses, and silage appears more economical than a more complex ration containing several feeds and legume hay. Shrimp meal is also being compared with cottonseed meal.

Three years' results with cows on pasture and good roughage with no grain, little grain or half grain ration indicate the milk production to be 60, 85, and 90 per cent respectively of that on full grain feeding. This experiment clearly indicates that with a good milk market, grain can be fed liberally but at lower prices more economical production occurs with less grain and more roughage feeding (La. Sta. Bul. 241).

The average value of dry feed replaced by pasture at L. S. U. during the past four years averages over \$35.00 per cow. These pastures averaged five and one-half tons of grass hay per acre which contained over 20 per cent protein in March and one-half as much

protein in August. Over 500 grass samples show the same trend. More high protein grain should thus be fed in late summer than spring.

The feed cost of raising heifers to freshening, based on L. S. U. records and present prices, is about \$70 where whole milk is sold and \$40 when only cream is marketed. Replacing whole milk with skim-milk powder or skim-milk in surplus seasons and greater use of pasture for older heifers will reduce these costs, but only well-bred dairy heifers can be economically retained on most dairy farms.

At the North Louisiana Experiment Station, three years' results of grazing oats and vetch, rye, or barley, gave that respective rating. All gave a profitable increase of 3 cents per cow per day over no winter pasture. Sudan grass increased milk production 13.6 per cent over Bermuda, and 11 per cent over Kudzu pasture in three trials. In one trial green soybeans gave 2.3 pounds more milk per day than Sudan, showing the possibilities in maintaining good summer milk flow and raising a legume hay or green manure crop with one planting of seed.

Ten grade Jerseys used for experimental work with pastures have averaged over 300 pounds butterfat per cow during each of the past four years and returned \$2.37 per day over feed, power, light, and milk hauling costs. This not only gave a good wage for labor but the land has been greatly improved during this time. The application of these results to the best one-third of the 41,000 cows in the 10 surrounding hill parishes would mean more than a quarter million dollars to the owners.

Permanent pasture at this station top dressed with 400 pounds of a 4-10-5 fertilizer averaged for three years 3,278 pounds hay; without nitrogen, 2,248 pounds, with phosphorus only 1,533 pounds, and unfertilized, 1,071 pounds. Results obtained with J. L. Fletcher at Lafayette the past three years gave 15.6 per cent more hay on limed than unlimed pasture, 43.5 per cent increase with nitrate of soda, and 46.6 to 180 per cent increase with nitrate and superphosphate. The average value at 30c per pound butterfat of the increase over feed and fertilizer costs for the latter treatment over unfertilized pasture in five trials were \$26.00 per acre. The addition of nitrate and superphosphate is thus proved profitable for similar pasture when the market is 20c per pound butterfat or above. Superphosphate increased pasture growth one-third at the Hammond station.

Other dairy research includes studies on the cost and value of dairy bulls, feed costs of milk production, sweet potatoes for milk production, mineral deficiency of pasture grasses and dairy cattle. These results are available to aid in reducing the cost of production in dairy farming.

HORTICULTURE

Irish Potato Investigations. Results obtained from fertilizer experiments have established with fair accuracy the nutrient requirements of the Irish potato in the state. The best size of seed piece to use and the proper spacing in the row have been determined. These findings are estimated to be worth \$500,000 to the growers in saving on cost of seed and fertilizer to those using excessive amounts and increased profits due to increase in yields where insufficient amounts were used.

Experiments carried out in cooperation with the Cuba Agricultural Experiment Station have demonstrated the superiority of Louisiana Junior Certified seed over Canadian seed, which has been used in the Island. As a result of this investigation, 30 cars of seed, worth \$18,000 have already been sold so far this season in Cuba, Panama, Hawaiian Islands and in Florida. This will be an excellent outlet for the smaller potatoes which in seasons of low prices are a drag on the market and the farmer usually nets around 25 to 50 cents a hundred. This year from the above sales the farmer will net around \$1.10 per hundred for his potatoes. This is the accomplishment of only one year's work.

Cabbage Investigations. An outstanding strain of the Copenhagen Market variety has been developed. Due to uniformity and high percentage of marketable heads produced, this strain will increase salable cabbage by 25%. In Louisiana the annual value of cabbage grown as a truck crop is about \$300,000.

Fertilizer tests have shown that with proper fertilization cabbage yields can be economically increased by approximately 50%.

Improvement work has been carried on with the collard. One hundred pounds of improved seed have been distributed over the state. This stock is so much superior to anything on the market at the present time that growers are already demanding a large increase of this seed for their next year's crops.

Pepper Breeding (Hot). Uniform strains of Long Red Cayenne and Tabasco peppers have been developed. Thirty pounds of seed were distributed this year and for next season over 150 lbs. will be available to the growers. The improved strain of Cayenne produces about twice the yield of marketable peppers as compared with that commonly used. It is estimated that these strains will be worth about \$200,000 to the pepper industry of the state.

Shallot Breeding. Shallots have been grown from seed and sets thus produced to the amount of one ton which were free from pink root were distributed to growers. Superior strains have been selected. This work means a great deal to the shallot industry and is estimated to be worth \$25,000 annually.

Bean Investigations. Fertilizer, spacing and variety experiments have been conducted. Where beans followed a legume crop, turned under, in the fall, no fertilizer was necessary. Heavy applications of fertilizer are not necessary in the spring. This is one of Louisiana's leading truck crops for both spring and fall shipments and results of these investigations have been estimated to be worth \$50,000.

Sweet Potato Investigations. For the past four years this Department has been carrying on investigations with the fertilization of sweet potatoes. We have found that a small application of fertilizer, say 400 lbs. per acre, will increase the average yield in the commercial sweet potato district by 100 bushels of U. S. Number 1's per acre. This means that the growers who follow the Station's recommendations could increase their average yield of potatoes by at least a fourth more than what they have been obtaining heretofore. Another important phase of sweet potato investigations has been selecting high yielding strains. We have made substantial progress along this line. This season we have grown a considerable lot of this selected seed to be distributed among the farmers of the state at cost of production. We will probably have around 400 bushels this year. This improved seed gives 20 to 25% increase over the potatoes now used for seed. Besides being high yielders, our potatoes are free from disease and insects. Heretofore the farmers have not had a place where they could buy seed potatoes of reliable origin. This work is valued at \$200,000 to the farmers of the state.

PARASITOLOGY

The work of the Department of Parasitology deals with the prevention and treatment of parasitic diseases of domestic animals. An extensive study of coccidiosis in chickens has been carried out, and some experiments on some of the newer drugs used in the removal of parasites have been conducted testing their action on the worm parasites of chickens.

Coccidiosis is most common among growing chickens and frequently causes mortality from 50% to 100% in natural epidemics. Many of the individuals that survive the disease are left in an unsalable and unthrifty condition for months after the epidemic. Study of this disease at this station has been chiefly concerned with the following facts:

1. A study of the various stages of the organism shows that often it reaches the infective stage in less than 24 hours after being passed in the droppings of infected birds. This makes necessary the cleaning of brooder houses, in which litter is used, every day instead of once or twice a week, as is the common practice, in order to prevent epidemics of the disease.

2. The effectiveness of disinfectants has been studied as a means of controlling outbreaks in brooderhouses. The results show the organisms are very resistant to the action of the economical disinfectants in common use. Lye, formaldehyde, and carbolic acid have been found ineffective and should not be relied on to prevent outbreaks of the disease. Iodine suspensoid has been found effective in killing the cysts but this preparation is much too expensive to be economically used. The use of properly constructed wire floors and the strict application of sanitation to the construction of mash feeders and drinking fountains can be relied upon to prevent the occurrence of the disease.

3. Economic losses from coccidiosis have been found to occur as follows:

A. Deaths: Under the carefully controlled conditions of the experiments it has been found that 22.7% of the 671 inoculated chickens died from the disease. Almost 91% of the total number of deaths occurred on the 5th, 6th, and 7th days after infection, and almost all of the remainder died as a result of becoming chilled. It has been found that deaths can be reduced by supplying the sick birds with heat and by keeping them entirely quiet until they have recovered.

B. Weight: Economically, the loss in weight in birds having the disease at 7 weeks of age varies from 15% to 5% in the two sexes at various times up to 3 months after the occurrence of the epidemic. In some lots, 10% of the survivors were still unsalable three months after the epidemic. Poultrymen can save feed and expense of care by removing and disposing of birds that are still unthrifty two to four weeks after the outbreak of the disease.

C. Egg-production: It has been found in these experiments that severely affected pullets that had the disease at 7 to 8 weeks of age laid 45.5% less eggs over a year period than other birds of the same lots which did not have the disease. Also they began to lay 6.5 weeks later than the uninfected birds. It is believed that losses from this source can be largely reduced by eliminating the birds that are still unthrifty three to four weeks after the outbreak of the disease.

It is believed that the increased profits from the resulting healthy birds will quickly repay any poultryman for the extra expense of providing the necessary equipment to prevent infection from the organisms causing this disease. For the small poultry raiser who uses hens for brooding, confinement in a small wire covered pen, which is moved daily to a fresh, new grass plot, is recommended. The object to be attained in the methods adopted is to prevent the chickens from picking up the organisms causing the disease in contaminated feed or drinking water. Poultrymen must remember that

regardless of the method adopted that these organisms become infective within 24 hours after being passed in the droppings.

4. A microscopic study of the walls of the regions of the digestive tract attacked by the organisms causing coccidiosis indicates that the damage done by them is not repaired by nature in a normal manner, and explains the reasons for the unthrifty condition and unprofitableness of the severely affected birds. This also indicates the probable uselessness of treatment and emphasizes the importance of prevention and the elimination of the severely affected birds. The use of powdered buttermilk, so widely recommended, has been found of no value.

5. Age resistance or immunity to coccidiosis: It is a common belief among poultrymen that if chickens are raised successfully to the age of ten to twelve weeks that they are resistant to coccidiosis. It has been found in these experiments in which birds of all ages up to 8 months have been inoculated that they are susceptible at any age, and that preventative measures should be continued throughout the life of the birds.

6. Inherited resistance or immunity to coccidiosis: The results of these experiments show a wide difference in the severity of the disease in different families of the inoculated birds and suggests the possibility of breeding resistant strains.

The effectiveness of certain drugs in the removal of parasites from chickens has been under investigation by the Department of Parasitology. In practice it has been observed that the preparations in common use have two disadvantages: 1, they are more or less ineffective in the removal of the parasites; and 2, they are toxic and cause loss in egg-production. Two new drugs have been studied, namely hexylresorcinol and normal butylidene chloride. The experiments completed indicate that normal butylidene chloride is almost 100% effective in the removal of the parasites and that it has no harmful effects upon the chickens.

PLANT PATHOLOGY

Sugar cane has been for a long period one of the principal agricultural crops of Louisiana and the prosperity of the southern part of the state depends on it to a very large extent. As a result of a number of factors, the most important of which is the attack of three diseases, root rot, red rot and mosaic, the sugar industry declined to such an extent that a crisis resulted. Many plantations have been lost to the growers and most of the others are heavily mortgaged.

At the present time, the sugar industry is on the road to recovery and many plantations are making money in spite of the present depression with the very low prices. This recovery has been brought about very largely by the research work of the Louisiana Agricultural Experiment Station and of the United States Department of Agriculture. This has been brought about by the substitution of varieties and by certain modifications in cultural methods and procedure.

The department of plant pathology has cooperated to a very material extent in this work. Much information has been procured concerning the diseases and the physiology of the root system of cane. This information has been the basis for the recommendations regarding the cultural methods. Also, as new varieties have been introduced, information has been obtained rapidly regarding their susceptibility to disease. This information has permitted the early discarding of unsatisfactory varieties and has also shown that some of the varieties being planted on a large scale are dangerous canes which may fail under certain conditions. The latter canes are gradually being replaced. Such information will prevent the occurrence of another crisis in the sugar industry.

DEWBERRY AND BLACKBERRY ROSETTE

Although climatic conditions are very favorable, it has been impossible to grow blackberries and dewberries in Louisiana on a commercial basis because of the rosette or double blossom disease. These fruits should become very important in this state. If they could be grown economically, the berries could be put on the market immediately after the strawberry shipping season closes. This would mean that the period of shipping small fruits in Louisiana would be extended for another six weeks.

Research work during the past two years in the department of plant pathology has given information which will be very valuable in controlling the rosette disease. It has been found that infection takes place a year before the disease becomes visible and only on the young canes, the ones that produce the fruit the following year. Based on this fact, control measures which include spraying and the cutting back of the young shoots are being formulated which offer great promise and it now seems very probable that dewberries and blackberries can in the future be grown on a commercial scale.

STRAWBERRY DISEASE INVESTIGATIONS

A few years ago, the strawberry industry showed signs of a rapid decline. Old fields and districts were failing and the industry was being maintained by extension into new areas. One of the principal causes of the decline was the presence of certain diseases, among which were the leaf spot and scorch. To control these diseases, a system of spraying has been formulated by the department

of plant pathology which has given remarkable results. This system was based on information on the life history of the disease organisms and the relation of these to our climatic conditions, information which had been previously obtained by our research investigations. Spraying with Bordeaux mixture from seven to eight times during January, February, and early March when conditions are most favorable for the spread of the disease has resulted in almost complete control. This increases the money value of the crop from \$50.00 to \$200.00 per acre. These control measures are being practiced at the present time to a very large extent by the strawberry growers and this practice has been a large factor in the continuation of the strawberry industry in Louisiana.

TOMATO WILT

In the past, the tomato wilt has been a very serious disease in Louisiana. Some sections of the state could not grow tomatoes. Some years ago, the department of plant pathology started breeding work to obtain a variety resistant to the disease. Two varieties were obtained, the Louisiana Red and the Louisiana Pink, which would produce crops in sections where tomatoes had not been grown for years. These were some of the first wilt resistant varieties produced in this country. These tomatoes are still being grown in Louisiana, Texas and neighboring states on a large scale, as they will produce more than other varieties. Of more importance, however, is the fact that these varieties are being used in a number of places for breeding stock for more satisfactory wilt resistant varieties. They seem to carry the characters of wilt resistance and heat resistance to a greater extent than any of the other varieties now on the market.

POULTRY

STORAGE OF LOUISIANA EGGS

The use made of experimental results in storing Louisiana eggs is illustrated by the experience of a nearby poultryman. This man produced an abundance of high quality eggs for which he had a satisfactory market, except during the season of flush production. Basing his judgment upon the results of five years work at the Louisiana Experiment Station, he stored 400 cases of low priced spring eggs, and sold them at a profit of five cents per dozen, or a net gain of \$600.00 for one season. It is estimated that if all surplus spring eggs of Louisiana were stored a profit of \$300,000 might be realized by poultry keepers of the state. Bulletin 229, of the Louisiana Agricultural Experiment Station, gives the detailed results of egg storage studies made at this station.

USE OF RICE BY-PRODUCTS IN POULTRY RATIONS

Louisiana imports a goodly percentage of the feedstuffs used in poultry rations. An urgent need exists, therefore, that locally produced feedstuffs be utilized to the best advantage. With this in mind, experimental work was conducted with growing chicks and with hens in order to determine the value of rice by-products as feeds for poultry. This work has determined conclusively that rice bran, rice polish, and brewer's rice can be utilized with equally good results to replace higher priced wheat, oat and corn products in growing rations and laying rations. Use of rice by-products reduces the cost of poultry rations 10 to 30 %, which may well be the margin between profit and loss with the poultry flock. Louisiana Agricultural Experiment Station Bulletin 243 presents detailed results of experiments with rice by-products.

SHRIMP MEAL, A PROMISING PROTEIN SUPPLEMENT

Preliminary tests in which shrimp meal, a local product, is used as a protein concentrate to replace meat scraps (produced outside the state) indicate that satisfactory results may be obtained with shrimp meal in growing rations and laying rations. If further experiments substantiate these results, which is probable, the use of shrimp meal will result in a tremendous saving in feed costs. Meat scraps sell retail for \$2.50 to \$4.50 per cwt., while shrimp meal sells for \$1.00 to \$1.50 per cwt.

Rearing Chickens in Confinement

Coccidiosis, a disease of young chickens, was resulting in the loss of thousands of dollars to poultry raisers in every parish of the state. Internal parasites stunted growing birds and lowered egg production in the laying flock. A practical method of control of these menaces was demanded by poultrymen of the state. As a result, experiments have been conducted in which chickens have been grown and kept under a variety of conditions and a plan of management developed which does much to control these losses.

The use of wire floors in the brooder houses, rotated growing ranges and rotated yards for the layers has greatly diminished the losses resulting from coccidiosis and internal parasites. If a movable laying house is used and the birds range over the farm, the house should be moved to a new location several times each year.

BLACKSTRAP MOLASSES IN POULTRY RATIONS

On the basis of limited tests blackstrap molasses appears to have possibilities as an ingredient for poultry rations to replace higher priced grain products. Molasses is being tested in growing rations, laying rations and fattening rations.

HATCHABILITY STUDIES

The problem of reproducing the flock with greatest efficiency is of paramount importance to all poultry keepers. Under existing conditions it is necessary to set at least fifty per cent more eggs than the number chicks expected. Extensive examinations of eggs that failed to hatch have shown that breeding is a very important factor in hatchability. These examinations in connection with inheritance studies listed below have made possible the elimination of certain inherited defects from the breeding stock.

Inheritance Studies

Permanent improvement of the poultry flock is dependent upon the establishment in the breeding stock of desirable inherited characters and the perpetuation of these desirable traits from generation to generation. Conversely undesirable characters must be eliminated from the breeding stock. Much remains to be learned concerning inheritance in poultry and progress is necessarily costly and slow. Several undesirable characters such as dwarfism, "crippled" chicks, malpositions of embryos and an embryonic sex-linked lethal gene (which kills one-half of the females) have been identified and steps are being taken to eliminate these undesirable characters from the breeding stock.

The possible linkage of certain inherited morphological characters and of desirable economic qualities is being studied.

Electric Heat for Battery Brooders

The advent of battery brooding in recent years has given great impetus to the use of electricity for heating brooders and questions as to power consumption have arisen. Electric power is now available to many Louisiana farmers at fairly reasonable rates. Based upon a usable capacity rating (about 21 sq. in. per chick) the average power consumption per chick brooded in battery brooders, in a room with supplemental heat, was as follows:

	February	March	April	May	Average for season
K. W. H. per chick brooded to 3 wks. age.....	.87	.80	.75	.72	.79
K. W. H. per chick brooded to 4 wks. age.....	1.29	1.19	1.10	1.06	1.16
Average room temperature....	76.8	77.6	79.2	80.5	77.9
Minimum temperature any one day.....	69.5	72.0	74.0	77.0	

These figures are somewhat higher than those given for previous experiments and by manufacturers but the difference is due to chick capacity rating rather than to excessive power consumption.

SUGAR STATION

CANE VARIETIES

The sugar industry in Louisiana reached its high point in 1904 when the crop was 398,194 short tons of sugar and the yield per acre is recorded as 26 tons. Shortly after 1904, due to an unfavorable Government attitude, the sugar industry began a slow decline, but the yield per acre continued to average around 20 tons of cane. About 1917 a complication of diseases was found attacking the sugar cane crop of this State and this condition continued until in 1926 the crop consisted of only 47,000 short tons of sugar and a yield of 6.8 tons of cane per acre. At about this time the P. O. J. canes were introduced into commercial plantings, and the effect of these disease-resisting canes upon production was that in 6 years the crop had increased until in 1932 it was 222,760 short tons of sugar and the yield of cane per acre was 15.5 tons. There were three varieties of the P. O. J. canes given to the sugar planter.

One of them, P. O. J. 234, was found to yield satisfactory plant cane crops, but was poor as a stubble cane variety. However this variety matured early and gave the most satisfactory returns of sugar per ton of cane.

The second of these varieties, P. O. J. 213, which for a while was most popular because of the satisfactory yields of cane and fairly good returns at the mill, soon proved susceptible to red rot and root rot and had to be largely abandoned.

The third of these canes, namely P. O. J. 36, was found satisfactory on certain types of soil, but as a general thing was entirely too late in maturity for large scale use.

Had there been no intensive investigational work on varieties of sugar cane, the P. O. J.'s would not have been capable of sustaining our industry. Fortunately both the United States Department of Agriculture, through its Office of Sugar Investigations, and the Sugar Experiment Station of the Louisiana State University were at work on this problem, and the sugar planters due to this investigational work now have four other varieties of cane which are rapidly taking the place of the original P. O. J. canes. The 1934 crop will be very largely grown from these newer varieties, which are superior in yield of cane per acre and equal to the P. O. J.'s in sugar per ton. It is not unreasonable at all to predict that the sugar crop in Louisiana after this year will increase from about 15 tons to 20 tons per acre.

For quite a number of years the price of sugar has been below normal, and profits from sugar plantations have been hard to make. If no other investigational work were done, the sugar industry would certainly be standing blindfolded on the edge of a precipice.

Fortunately for the sugar planters, the work of the two above mentioned agencies has been continued, and there are plantings of four additional new varieties of cane on some seventy or eighty plantations where seed cane of the most valuable varieties ever grown in Louisiana will be produced in 1934 for general distribution to the sugar planters of the State. These four varieties are all resistant or immune to the diseases which have proved so injurious to the cane of this State. They produce good tonnage, and yield a juice far richer than any that Louisiana has ever known.

The greatest handicap that the sugar industry of this State labors under today in its build-back to the days of old is the lack of sufficient milling capacity to take care of additional cane. One of the new varieties, namely C. P. 29-320, is extremely early in maturity. During the past three years tests at the Sugar Experiment Station of the University have shown this cane to be rich enough for profitable milling by the first of October. During recent years our mills have been forced to wait until the fifteenth of October or even the first of November for the P. O. J. canes to mature. This delay has reduced our normal mill run from 90 to 60 days. The value of this early maturing cane can be appreciated by turning back to the year 1929 when there was a very heavy crop of P. O. J. 213 which was not ripe enough for milling until November 1. During the early December of that year a severe freeze occurred followed by extremely bad weather in January. On account of the weather and the late start, some of our largest plantations lost fifty per cent of their crop which could have been saved if the cane had been mature enough for milling by October 1.

SOILS

Remembering that the sugar industry went through a very long period of declining yields, it is but natural to find that the land owners allowed the fertility of their soils to go down. Lack of soil fertility played an important part in the disease situation which was so disastrous in the twenties .

The Experiment Station at Baton Rouge conducted soil building experiments and discovered that the sugar belt soils could be built back to maximum productivity in two years by rotation with legume crops, particularly the soybean, when these legume crops were turned under. Under a well balanced rotation program the yields of cane at the Sugar Experiment Station have about doubled the average yield of the State for the past three or four years. The value of this work to the sugar industry can probably be best appreciated when it is known that the State Intermediate Credit Association two years ago made it mandatory that cane growers wishing to borrow through that organization carry out the recommendations in regard to rotation which were made by the Sugar Experiment Station. The results of this soil investigation not only enabled the

production of better crops, but where it is practiced it has been found unnecessary to use any commercial fertilizer on plant cane and that less fertilizer for stubble cane is required.

The savings of the sugar planters in their fertilizer bills would be sufficient to repay several times the appropriation for all of the investigational work done in the State.

One of the heaviest expenditures necessary to be made in raising sugar cane is feed for the livestock. The Sugar Experiment Station has found that a small dosage of nitrogenous fertilizer on corn following stubble cane turns the corn crop from practically a failure to a profitable crop. In addition the use of readily available nitrogen on the corn crop hastens the maturity of the corn, thereby giving the sugar planter a better chance to harvest the crop and get his land into good shape for fall planted sugar cane.

FINANCIAL REPORT, AGRICULTURAL EXPERIMENT STATIONS
LOUISIANA STATE UNIVERSITY
July 1, 1931 — June 30, 1932

	State Fund	Fert. & Feed Fund	Special Sugar Cane Fund	Hatch Fund	Adams Fund	Purnell Fund	Delta Station Fund	American Cyanamid Fund	Chilean Nitrate Fund	Grasselli Chem. Fund	M. V. Potash Holland School Fund	TOTAL
RECEIPTS												
Balances July 1, 1931	586.25	1,529.42	17,271.90				54.66	695.41	358.64	999.00		21,495.28
State Appropriations	50,000.00		14,500.00				10,000.00					74,500.00
Sales	17,760.34	6.12	118.87		.30		139.78					18,025.41
Industrial Fellowships								2,000.00	508.79		1,000.00	3,508.79
Interest on Bank Balances	540.24											540.24
Miscellaneous	2,345.62					13.24						2,358.86
Commissioner of Agriculture		20,939.69										20,939.69
U. S. Government Appropriations				15,000.00	15,000.00	60,000.00						90,000.00
TOTALS	71,232.45	22,475.23	31,890.77	15,000.00	15,000.30	60,013.24	10,194.44	2,695.41	867.43	999.00	1,000.00	231,368.27
DISBURSEMENTS												
Salaries	33,452.91	18,861.80	24,513.91	6,803.14	11,438.33	41,895.80	3,600.00	1,350.00	499.98			142,415.87
Labor	17,796.48	4,763.56	4,087.68	5,387.46	1,420.38	9,205.70	2,365.40		29.11	621.80	361.54	46,039.11
Stationery and Office Supplies	417.75	31.83	133.42	25.97	18.46	428.25	16.00		9.40		22.82	1,103.90
Scientific Supplies Consumable	35.35	891.40	149.18	138.22	531.02	324.40			17.78	.66		2,088.01
Feeding Stuffs	1,244.73	117.20	100.00		811.24	1,685.07					26.00	3,984.24
Sundry Supplies	1,845.15	252.93	161.02	255.96	85.00	667.34	349.22	40.00	21.23		5.92	3,683.77
Fertilizers	936.03	333.40	113.56	208.42		185.24			48.00			1,824.65
Communication Service	543.17	36.60	76.67	6.33	.80	262.51	71.67		.35		20.71	1,018.81
Travel Expenses	2,428.58	177.32	2,424.88	177.31	165.71	1,252.20	64.18	995.45	245.43	118.12	293.46	8,342.64
Transportation of Things	518.14	115.59	226.36	48.44	38.87	199.50	680.15		31.41	.95	17.81	1,877.22
Publications	105.30	4.64	392.72	1,601.63								2,104.29
Heat, Light, Water and Power	1,054.60	687.65	190.68	79.55	49.96	351.39	253.88				2.51	2,670.22
Furniture, Furnishings and Fixtures	171.26	44.07	181.91			54.01						451.25
Library	22.17	34.00			7.50							63.67
Scientific Equipment	41.98	85.98	4.15	.82	418.71	55.47						607.11
Live Stock	404.57				4.32	1,674.32	4.10					2,087.31
Tools, Machinery and Appliances	1,172.17	58.68	759.40	259.95	10.00	964.84	525.17				7.07	3,757.28
Buildings and Land	2,045.95	785.45	92.40	6.80		344.00	94.33					3,368.93
Contingent	772.06	206.90	3.15			463.20	235.69					1,681.00
TOTALS	65,008.35	27,489.00	33,611.09	15,000.00	15,000.30	60,013.24	8,259.79	2,385.45	902.69	741.53	757.84	229,169.28
Balances June 30, 1932	6,224.10	5,013.77	1,720.32				1,934.65	309.96	35.26	257.47	242.16	2,198.99
TOTALS	71,232.45	22,475.23	31,890.77	15,000.00	15,000.30	60,013.24	10,194.44	2,695.41	867.43	999.00	1,000.00	231,368.27

FINANCIAL REPORT, AGRICULTURAL EXPERIMENT STATIONS
LOUISIANA STATE UNIVERSITY
July 1, 1932 — June 30, 1933

	State Fund	Fert. & Feed Fund	Hatch Fund	Adams Fund	Purnell Fund	N. E. La. Station	American Cyanamid	Chilean Nitrate	Grasselli Chemical	N. V. Potash Holland Scholar- ship	TOTAL
RECEIPTS											
Balances July 1, 1932	4,503.78	5,013.77				1,934.65	309.96	35.26	257.47	242.16	2,198.99
State Appropriations	83,202.00					9,468.00					92,670.00
Sales	11,211.47					34.00					11,245.47
Industrial Fellowships							800.00			1,000.00	1,800.00
Miscellaneous	518.68										518.68
Commissioner of Agriculture		20,538.80									20,538.80
U. S. Government Appropriations			15,000.00	15,000.00	60,000.00						90,000.00
TOTALS	99,435.93	15,525.03	15,000.00	15,000.00	60,000.00	11,436.65	1,109.96	35.26	257.47	1,242.16	218,971.94
DISBURSEMENTS											
Salaries	57,596.56	13,188.75	7,475.00	11,863.33	42,449.96	3,600.00					136,173.60
Labor	21,464.79	2,426.21	4,087.49	1,328.05	9,157.98	2,390.93	750.00		229.25	390.55	42,225.25
Stationery and Office Supplies	256.63	81.24	310.42	7.73	290.03	20.25					966.30
Scientific Supplies Consumable	827.44	1,043.98	27.54	699.40	556.47					41.76	3,196.59
Feeding Stuffs	1,847.13	70.30	2.10	480.65	1,023.71	10.10					3,433.99
Sundry Supplies	1,549.08	210.61	110.87	63.39	414.66	460.09					2,808.70
Fertilizers	841.40	233.57	203.54		286.26	72.90					1,637.67
Communication Service	591.22	23.75	187.90	13.85	101.42	92.51	2.45			1.97	1,015.07
Travel Expenses	3,656.87	33.04	463.18	48.68	927.09	62.47	346.14		28.22	173.77	5,739.46
Transportation of Things	861.08	94.90	33.28	59.59	288.01	7.00				5.54	1,349.40
Publications	295.54		1,458.10		242.79						1,996.43
Heat, Light, Water and Power	2,005.12	205.27	66.35	33.30	406.76	414.87					3,131.67
Furniture, Furnishings and Fixtures	125.72		96.48		88.29						310.49
Library	17.15	30.22		5.00	2.25						54.62
Scientific Equipment	29.15	251.79	74.75	224.85	201.60						782.14
Live Stock	745.29			56.00	183.00						984.29
Tools, Machinery and Appliances	1,888.18	24.79	342.51	29.10	2,144.10	334.01					4,762.69
Buildings and Land	3,625.48	74.98	20.50	87.08	324.94	64.33					4,197.31
Contingent	1,189.97	15.75	39.99		910.68	324.90				11.20	2,442.49
TOTALS	99,363.80	18,009.15	15,000.00	15,000.00	60,000.00	7,854.36	1,098.59		257.47	624.79	217,208.16
Balances June 30, 1933	72.13	2,484.12				3,582.29	11.37	35.26		617.37	1,763.78
	99,435.93	15,525.03	15,000.00	15,000.00	60,000.00	11,436.65	1,109.96	35.26	257.47	1,242.16	218,971.94

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